San Francisco Sewer Inspection Methodology Presentation

October 13, 2016

“Traditional” Methodology

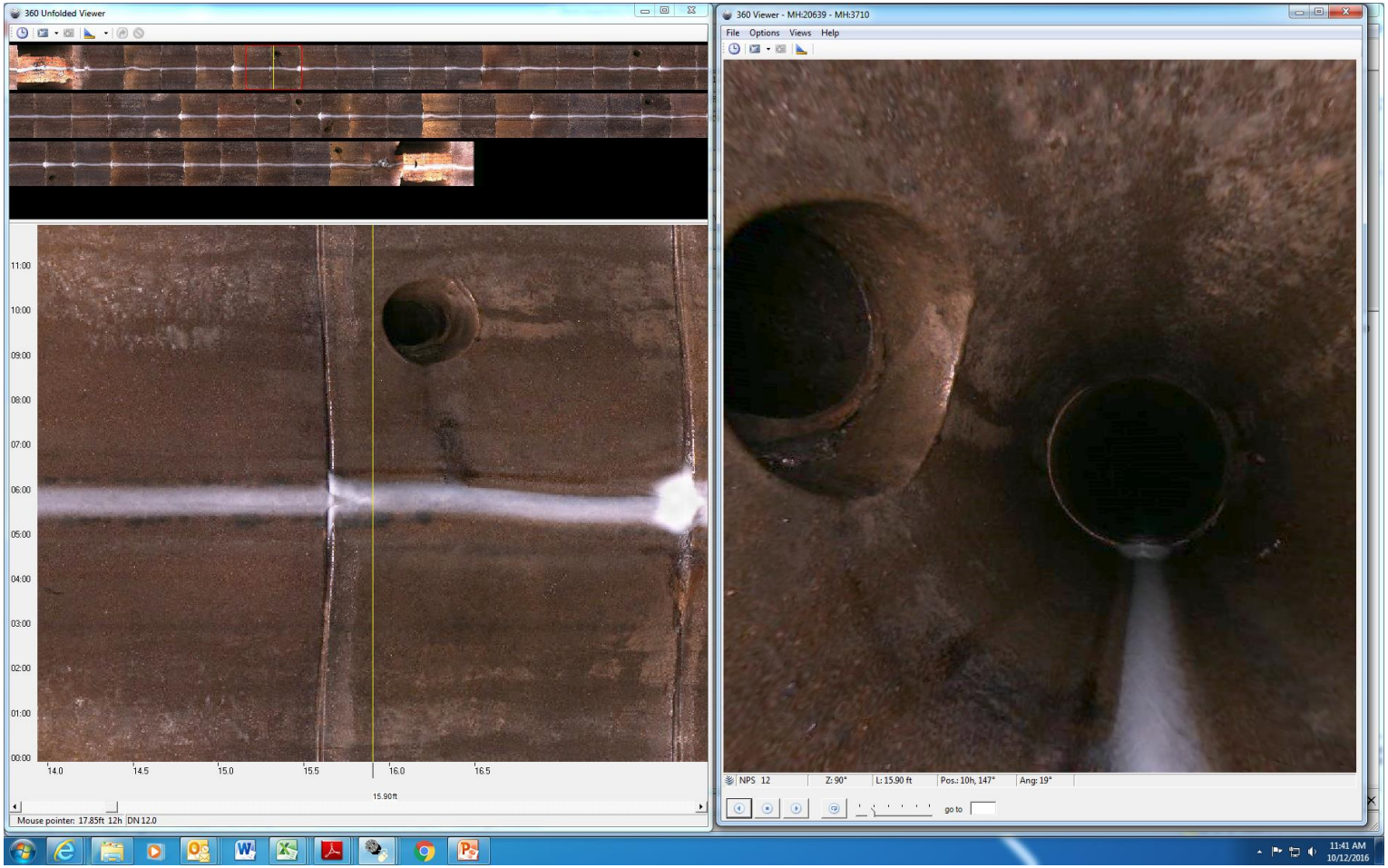
1. Pan & Tilt Camera
2. Panoramo 360 Camera (Est. Starting 2010)
3. Walking Inspection (For Larger Structures)

Pan & Tilt Camera (Sample)

Pan & Tilt Video

Panoramo 360 Camera (Sample)

Panoramo 360 Inspection Video



Pan & Tilt Camera

Advantage
- More Sturdy Than Panoramo 360

Disadvantage
- Inspection Limited to What Camera Points To

Panoramo 360 Camera

Advantage
- Reviewer Has Control During Video Review

Disadvantages
- Higher Sensitive To “Bumps” (Can Lead To Missed Images)
- Poorer Maneuverability (Esp. Thru Curves and Obstructions)
- Not As Good For Observing Certain Types of Infiltration

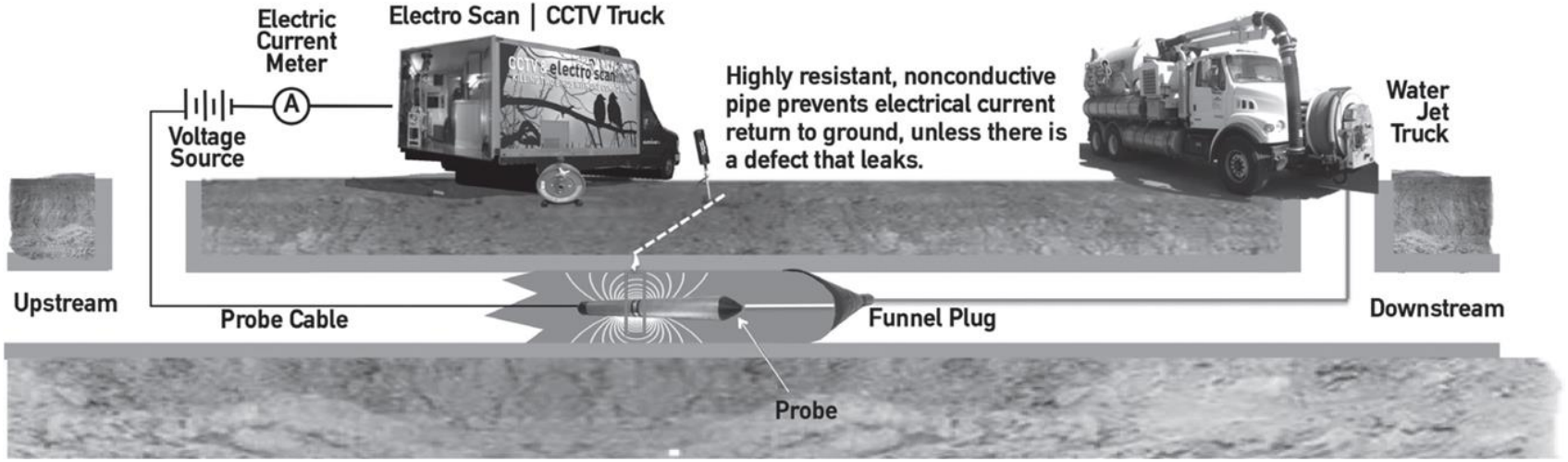
Latest Equipment Acquisition: Electro Scan

(For Detection of “Leaks” in Sewer
Due to Openings)

Electro Scan Truck Model ES-620

(Photo taken from the website www.electroscan.com)

Electro Scan Summary Schematic

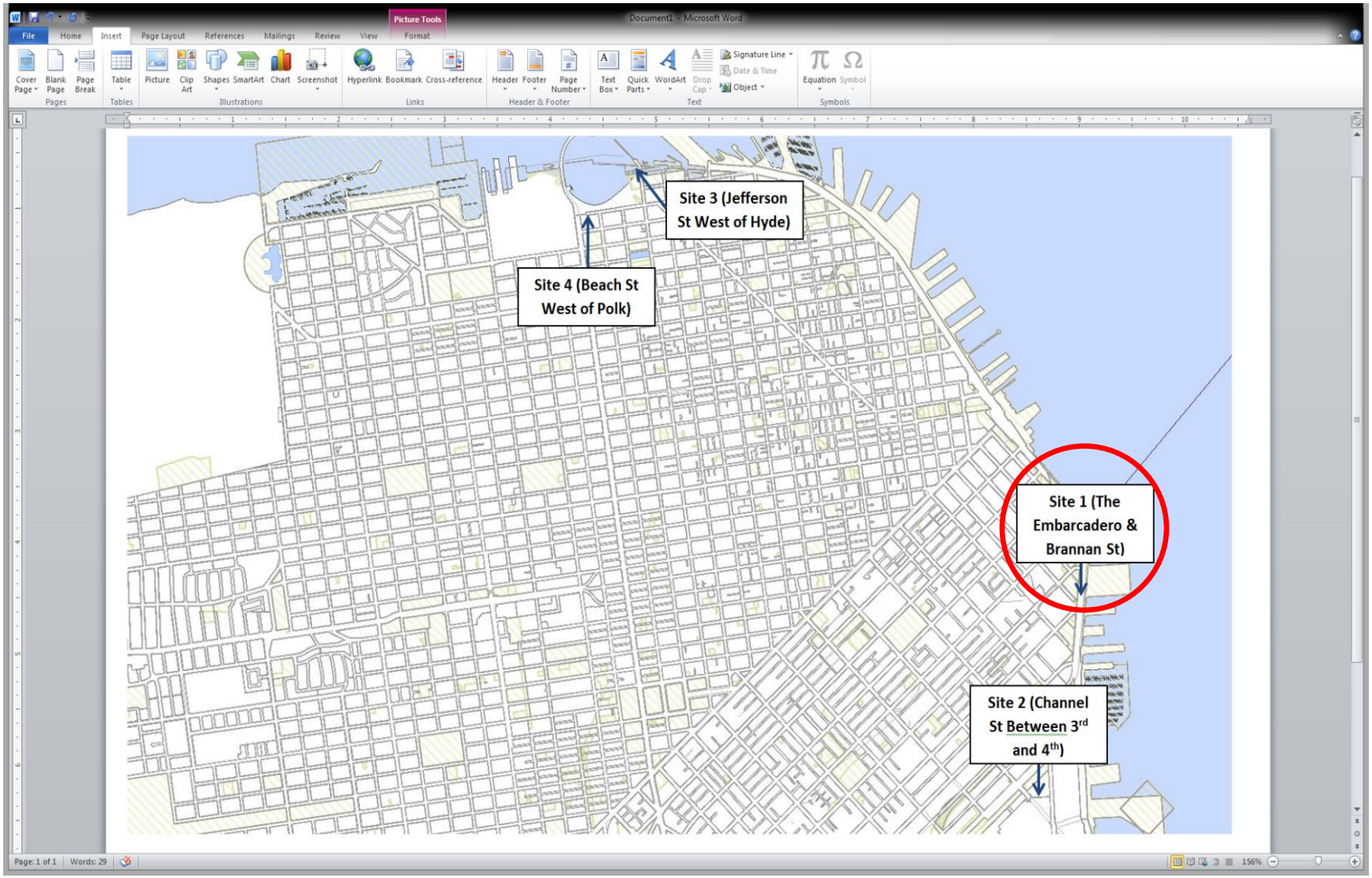


Electro Scan Demo

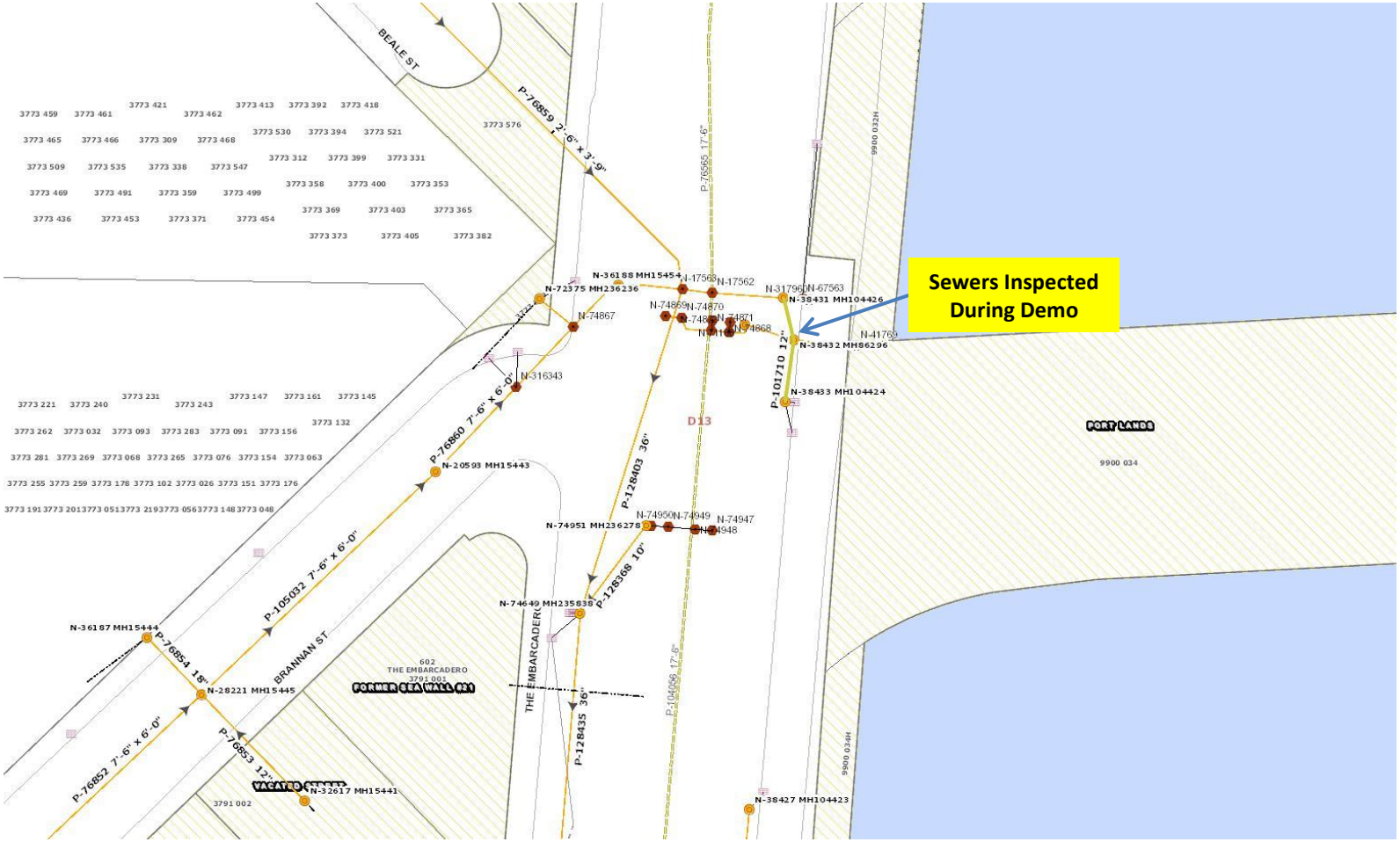
San Francisco, CA

September 15 & 16, 2015

Demo Locations



Site 1 – The Embarcadero & Brannan (East Side of Intersection By Brannan Outfall)



Site 1 (The Embarcadero & Brannan) – Upstream

Site 1 (The Embarcadero & Brannan) – Downstream

Electro Scan Demo Truck On Location

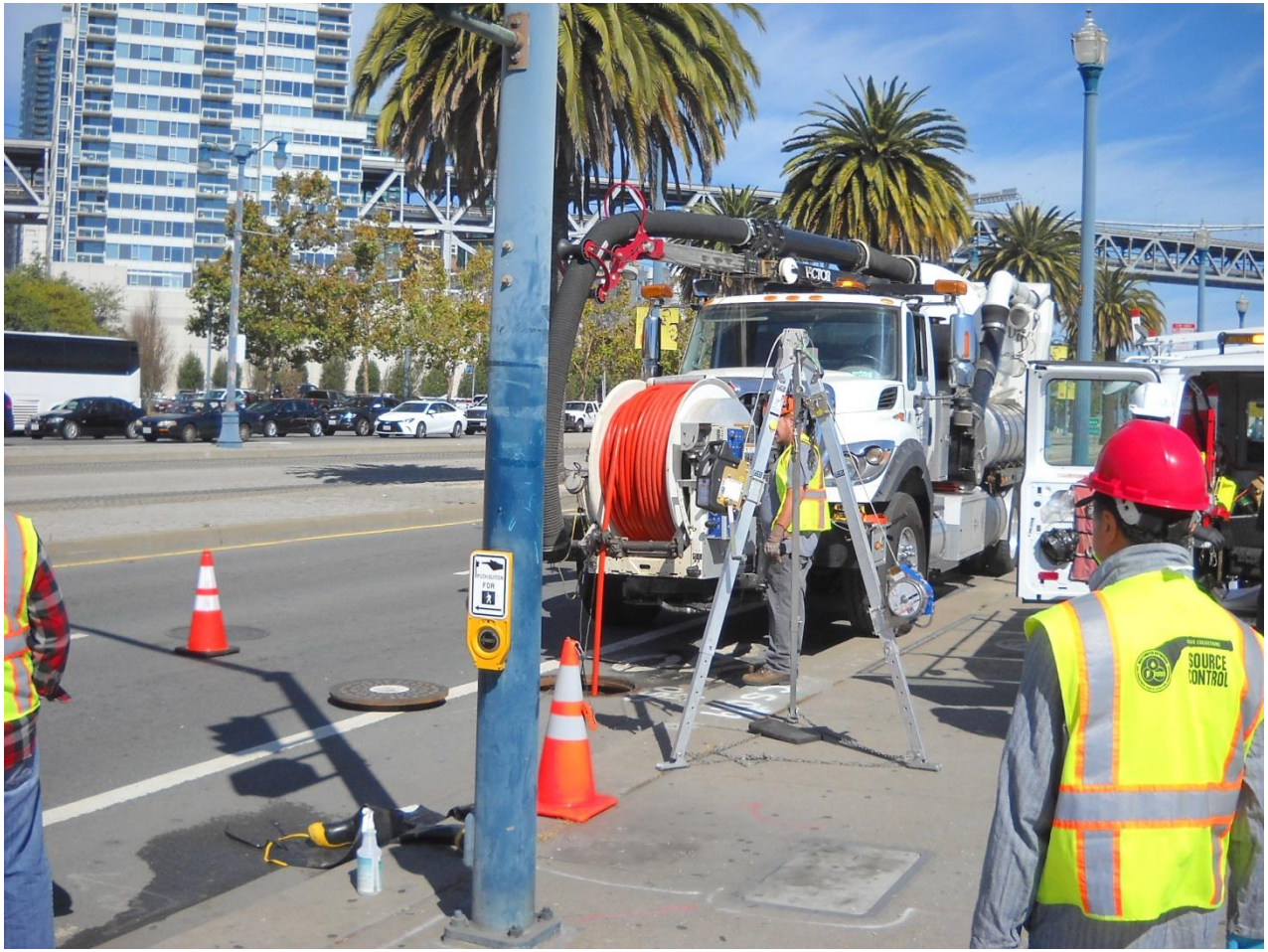
Known Leaking Joint At 12-Inch Sewer

Electro Scan Probe

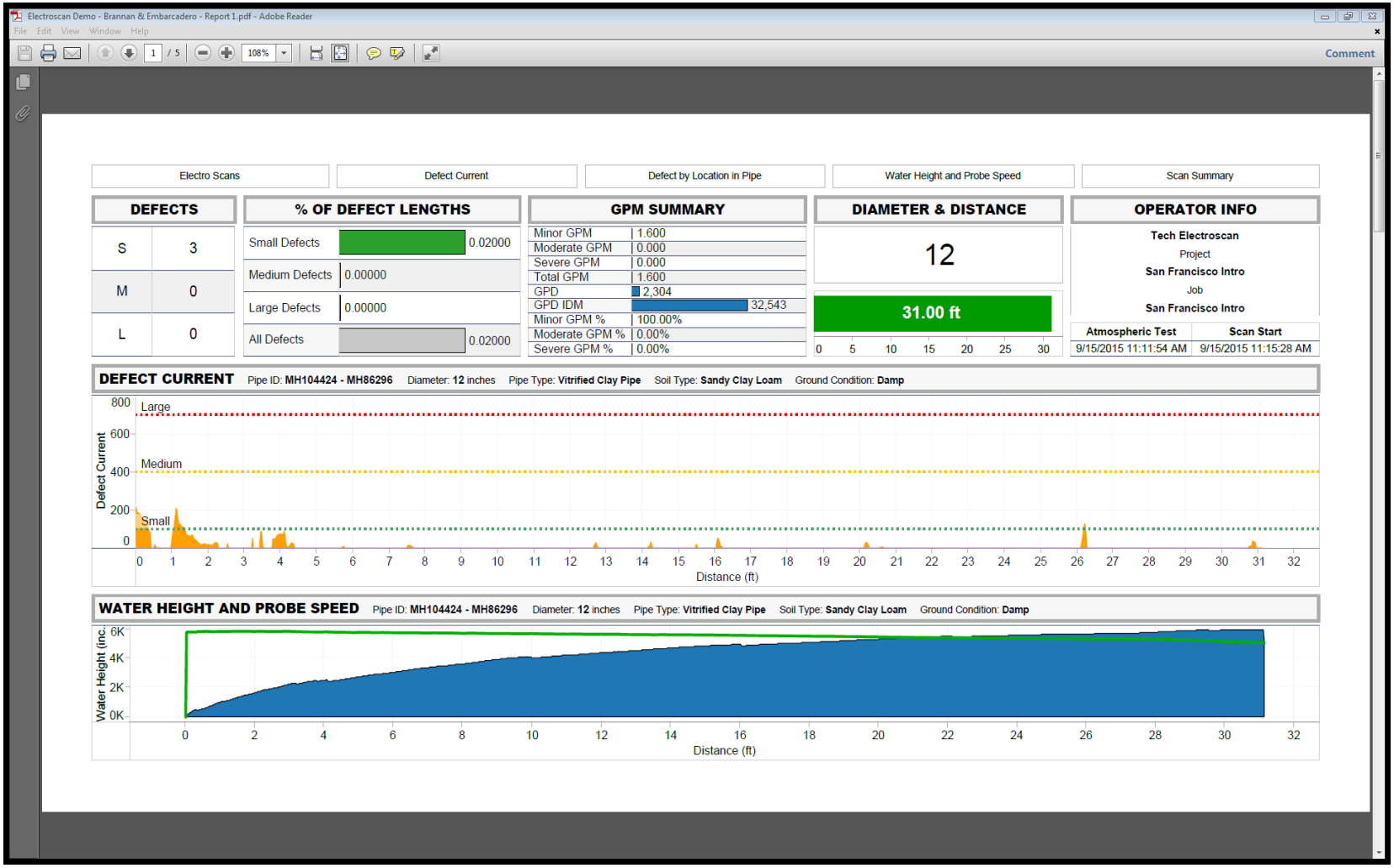
Cone For Directing Nozzle Spray

Lowering Of Probe (Connected to Jetting Nozzle) Into Upstream MH

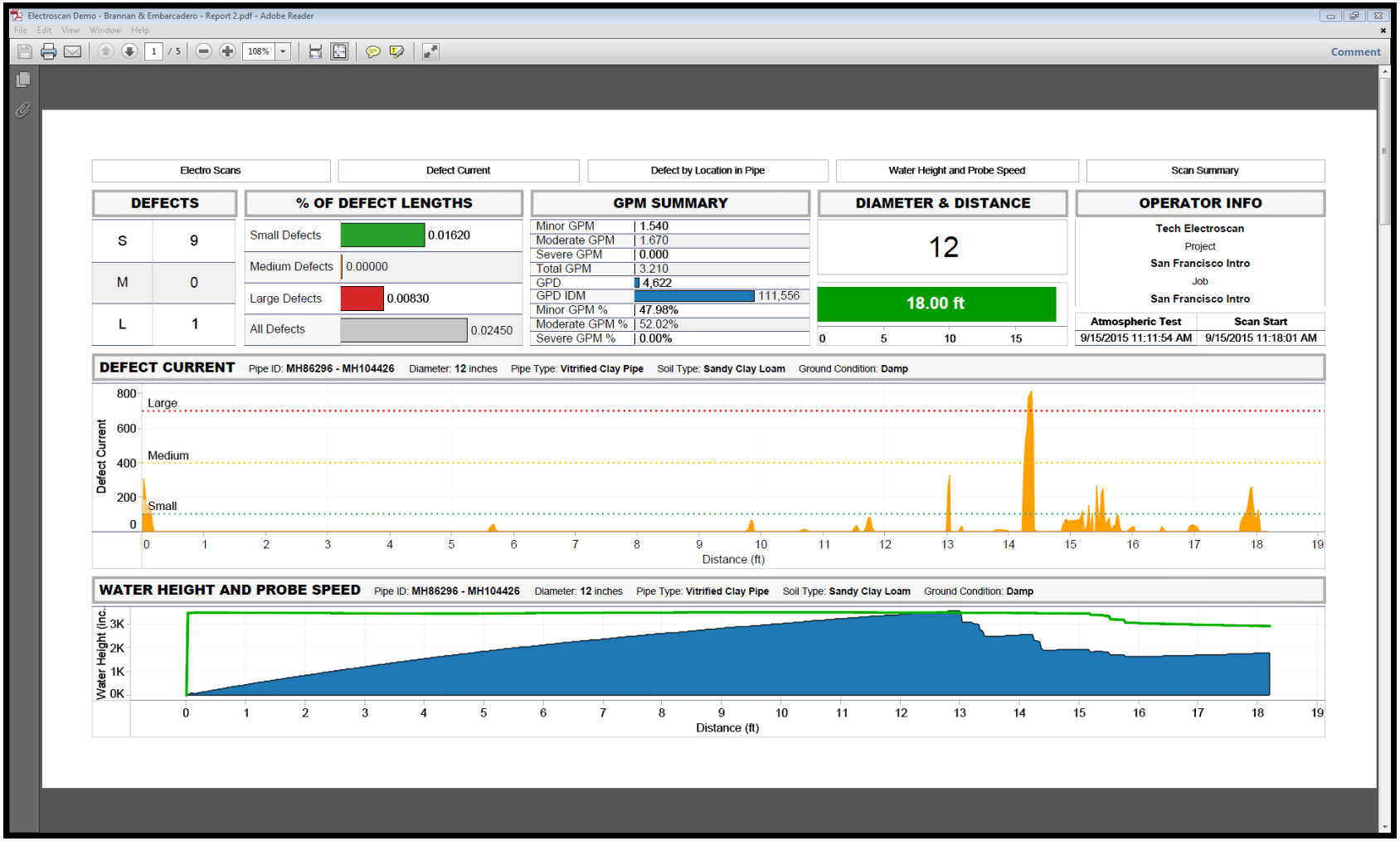
Vactor Truck Setup at Downstream MH (For Jetting Nozzle To Pull Probe)



Electro Scan Report (Page 1 For Segment 1)



Electro Scan Report (Page 1 For Segment 2)



Data Uploaded To Cloud Server

Assessed Via Critical Sewers

Follow Up With CCTV To View Cause of Electro Scan Defects (If Necessary)

Electro Scan Features Summary

- Can scan pipes up to 30” in diameter
- Probe emits 10 volts, 40 milliamps (Equivalent to 6 AA batteries)
- Assumes 1’ of head above pipe (for volume calculations)
- Can scan through grease and roots
- Can be used during wet weather
- No operator error
- Scans upload to cloud within minutes of completion

Electro Scan “Defects” Definition

Defects

- Small 100-400 µA
- Medium 400-700 µA
- Large 700+ µA

Infiltration is the defect current x the defect length

Electro Scan Used For TDML Locations:

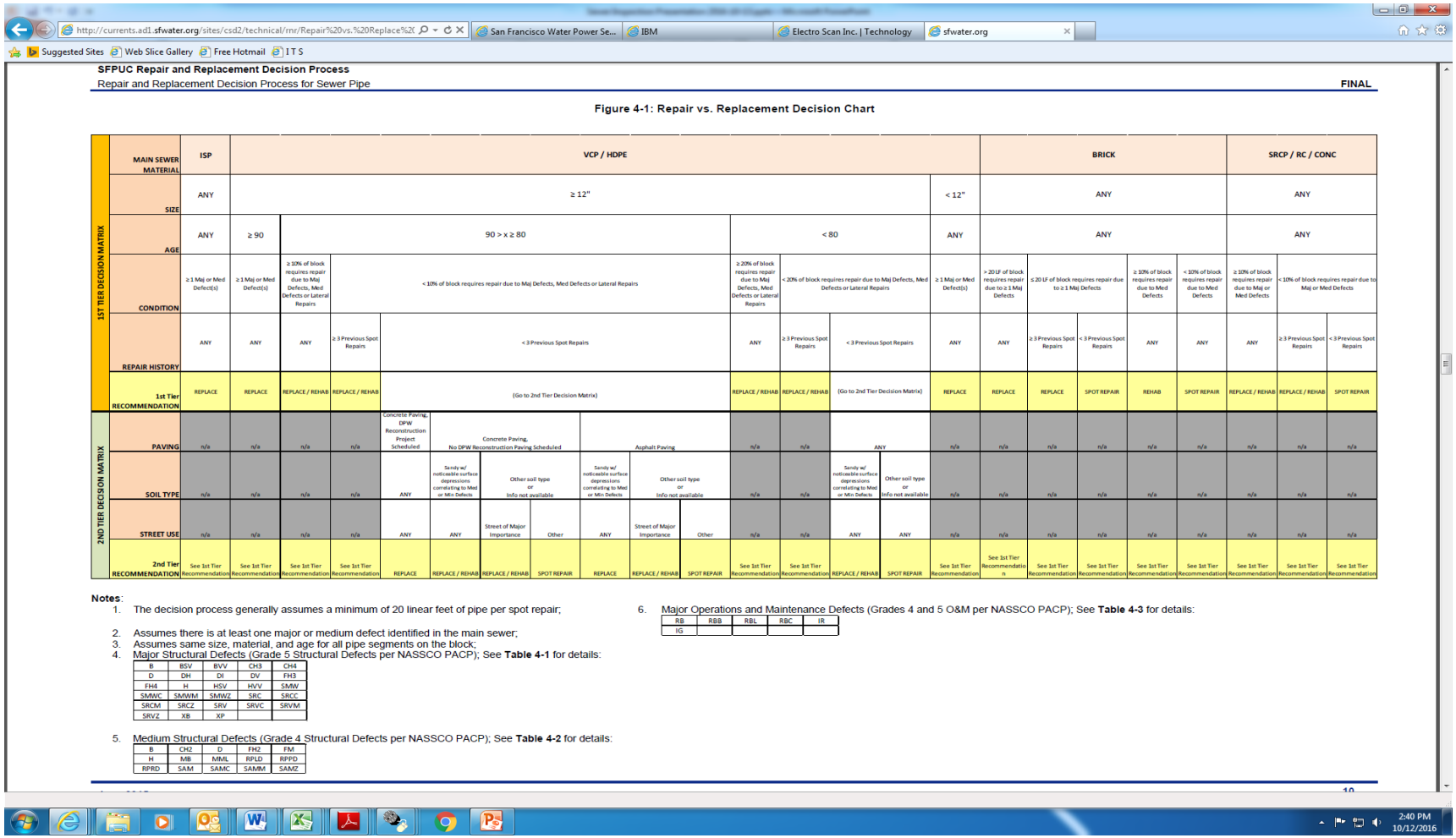
1. Candlestick Point
2. Crissy Field
3. Aquatic Park

Sewers sized 15 inches in diameter as less assigned

Other Inspection Methodologies

1. Pole Cam
2. Sonar (By Contractor)
3. Laser (By Contractor)

SFPUC “Repair vs. Replacement” Decision Process



SFPUC Repair and Replacement Decision Process

Repair and Replacement Decision Process for Sewer Pipe — **FINAL**

Figure 4-1: Repair vs. Replacement Decision Chart

1ST TIER DECISION MATRIX	MAIN SEWER MATERIAL	ISP	VCP / HDPE														BRICK					SRCP / RC / CONC				
	SIZE	ANY	≥ 12"													< 12"	ANY					ANY				
	AGE	ANY	≥ 90	90 > x ≥ 80								< 80				ANY	ANY					ANY				
	CONDITION	≥ 1 Maj or Med Defect(s)	≥ 1 Maj or Med Defect(s)	≥ 10% of block requires repair due to Maj Defects, Med Defects or Lateral Repairs	< 10% of block requires repair due to Maj Defects, Med Defects or Lateral Repairs							≥ 20% of block requires repair due to Maj Defects, Med Defects or Lateral Repairs	< 20% of block requires repair due to Maj Defects, Med Defects or Lateral Repairs			≥ 1 Maj or Med Defect(s)	> 20 LF of block requires repair due to ≥ 1 Maj Defects	≤ 20 LF of block requires repair due to ≥ 1 Maj Defects		≥ 10% of block requires repair due to Med Defects	< 10% of block requires repair due to Med Defects	≥ 10% of block requires repair due to Maj or Med Defects	< 10% of block requires repair due to Maj or Med Defects		
	REPAIR HISTORY	ANY	ANY	ANY	≥ 3 Previous Spot Repairs	< 3 Previous Spot Repairs						ANY	≥ 3 Previous Spot Repairs	< 3 Previous Spot Repairs		ANY	ANY	≥ 3 Previous Spot Repairs	< 3 Previous Spot Repairs	ANY	ANY	ANY	ANY	≥ 3 Previous Spot Repairs	< 3 Previous Spot Repairs
	1st Tier RECOMMENDATION	REPLACE	REPLACE	REPLACE / REHAB	REPLACE / REHAB	(Go to 2nd Tier Decision Matrix)						REPLACE / REHAB	REPLACE / REHAB	(Go to 2nd Tier Decision Matrix)		REPLACE	REPLACE	REPLACE	SPOT REPAIR	REHAB	SPOT REPAIR	REPLACE / REHAB	REPLACE / REHAB	SPOT REPAIR		
2ND TIER DECISION MATRIX	PAVING	n/a	n/a	n/a	n/a	Concrete Paving, DPW Reconstruction Project Scheduled	Concrete Paving, No DPW Reconstruction Paving Scheduled			Asphalt Paving		n/a	n/a	ANY		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		
	SOIL TYPE	n/a	n/a	n/a	n/a	ANY	Sandy w/ noticeable surface depressions correlating to Med or Min Defects	Other soil type or Info not available		Sandy w/ noticeable surface depressions correlating to Med or Min Defects	Other soil type or Info not available	n/a	n/a	Sandy w/ noticeable surface depressions correlating to Med or Min Defects	Other soil type or Info not available	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		
	STREET USE	n/a	n/a	n/a	n/a	ANY	ANY	Street of Major Importance	Other	ANY	Street of Major Importance	Other	n/a	n/a	ANY	ANY	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2nd Tier RECOMMENDATION	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	REPLACE	REPLACE / REHAB	REPLACE / REHAB	SPOT REPAIR	REPLACE	REPLACE / REHAB	SPOT REPAIR	See 1st Tier Recommendation	See 1st Tier Recommendation	REPLACE / REHAB	SPOT REPAIR	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	See 1st Tier Recommendation	

Notes:

1. The decision process generally assumes a minimum of 20 linear feet of pipe per spot repair;
2. Assumes there is at least one major or medium defect identified in the main sewer;
3. Assumes same size, material, and age for all pipe segments on the block;
4. Major Structural Defects (Grade 5 Structural Defects per NASSCO PACP); See **Table 4-1** for details:

B	BSV	BVV	CH3	CH4
D	DH	DI	DV	FH3
FH4	H	HSV	HVV	SMW
SMWC	SMWM	SMWZ	SRC	SRCC
SRCM	SRCZ	SRV	SRVC	SRVM
SRVZ	XB	XP		

5. Medium Structural Defects (Grade 4 Structural Defects per NASSCO PACP); See **Table 4-2** for details:

B	CH2	D	FH2	FM
H	MB	MML	RPLD	RPPD
RPRD	SAM	SAMC	SAMM	SAMZ

6. Major Operations and Maintenance Defects (Grades 4 and 5 O&M per NASSCO PACP); See **Table 4-3** for details:

RB	RBB	RBL	RBC	IR	
IG					

Decision Matrix Developed For Electro Scan Findings

SALTWATER INTRUSION SEWER REPAIR DECISION CHART

Last Revised September 23, 2016

DEFECT TYPE / DESCRIPTION		REPAIR RECOMMENDATION
Any Type of defects	Brick Sewers	Replacement (per recent internal proposal)
	Manhole	Manhole Point Repair
	Non-Circular Sewers	Manual Grouting
Significant "Grade 5" Defects (XP, D, BSV, BVV, HSV, HVV, B or H (2 positions or more), FH4, FH3, CH4, CH3)	Any Type of Pipe	Refer to "Repair Vs. Replacement Decision Flowchart"
Defect at Lateral	Break-In and Intuding Lateral	Refer to "Repair Vs. Replacement Decision Flowchart"
	Other Lateral Types	Point Repair
Defective Joint With No Other Main Sewer Defect Involved	Concrete Pipes > 24" Diameter (Any Number of Defective Joints)	Automated Grouting
	Less Than 25 % of Joint On Block Defective	Automated Grouting
	Greater Than 25% of Joints On Block Defective	Pipe Lining
Other Main Sewer Defects (Cracks, Fractures, Small Breaks and Holes)	Less Than 25% of Block Having Defects	Sectional Point Repair
	Greater Than 25% of Block Having Defects	Pipe Lining
Manhole Defects	Any Type Causing Infiltration	Manhole Point Repair

*Note: Prior to assigning repair, research should be performed as to whether sewer assets are on blocks scheduled for projects such as paving, streetscahpe, or others which may result in additional

Contractors Used By SFPUC Wastewater Enterprise

National Plant Services
Contact: Michelle Beason
Phone: 925-262-7366
E-Mail: mbeason@nationplant.com

Pipe and Plant Service
Contact: Bill Gilmartin
Phone: 888-978-8264
E-Mail: bgilmartin@pipeandplant.com

Professional Pipe Services (ProPipe)
Contact: Jason Walborn
Phone: 800-784-7473
E-Mail: jwalborn@hswcorp.com

The End